FOREWORD

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ABSTRACT

The serum free 17-OHCS response to local anesthetic procedures was evaluated in 258 systemically healthy young adult males. Subjects were not informed of their impending participation. Three groups of subjects were injected with different solutions, a fourth group underwent needle insertion with no injection, and a final sham group was taken through the anesthetic procedure without needle insertion. Preoperative serum free 17-OHCS means did not differ for the five groups. The increase in postinjection 17-OHCS levels was highly significant ($P < .001$) for all groups but not significantly different between the five groups. Thus, psychologic factors are of primary importance in the adrenocortical hyperactivity associated with intraoral injections.

This technical documentary report has been reviewed and is approved.

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STRESS IN DENTAL PATIENTS

Effect of Local Anesthetic Procedures

1. INTRODUCTION

It has been reported that procedures incident to the administration of local anesthetics in the oral area serve as a significant stimulus to the adrenal cortex (1). The present study was designed to examine this hyperactivity further, with special emphasis on the possible role of psychic stimulation in eliciting this cortical response.

2. MATERIALS AND METHODS

Subjects were 258 apparently healthy males between 17 and 22 years of age. The homogeneous nature of this experimental population has been previously described (2, 3). None of the participants had been scheduled for any type of dental appointment. Nor were they told in advance of their impending participation in this experiment. Thus, psychic anticipatory stimulation was held to a minimum and the subjects were directly comparable to the subjects not scheduled for dental operations in our previous experiments.

The subjects were divided into five experimental groups as follows: (a) 52 subjects received injections of 2% Lidocaine HCl; (b) 50 were injected with Lidocaine HCl with epinephrine 1:100,000; (c) 50 were given 0.9% sodium chloride injections; (d) 50 subjects experienced actual needle insertion but received no injection; and (e) 54 subjects were told they were being injected when, in fact, the needle, though placed in the mouth, did not even touch the oral mucosa.

A control venous blood sample was drawn from each subject between 7:30 and 8:00 a.m. Immediately thereafter the subject was seated in a dental chair and a conventional inferior alveolar-lingual nerve block procedure was carried out under one of the five treatment conditions. Aspirating type Carpule syringes with 1-⅝ inch, 25-gage needles were employed throughout the experiment. A new needle was used for each subject. For the noninjected groups, sterilized empty Carpules were in place in the syringes. In all patients receiving injections, approximately 1.0 ml. of solution was deposited very slowly in the area of the mandibular sulcus. Needle withdrawal was halted at approximately ¼ inch from the mucosal surface and about 0.5 ml. of solution was injected to anesthetize the lingual nerve. A period of 2 minutes was utilized in the injection process. No explanation was given the subject either before or after the injection, the only communication being a query as to whether or not the subject had ever experienced a reaction to local anesthetic agents. After injection the patient was seated alone in a quiet section of the laboratory and, 15 minutes after the time of needle insertion, a second blood sample was drawn.

The free 17-hydroxycorticosteroid (17-OHCS) concentration of the serum samples was determined by the methylene chloride extraction method of Peterson et al. (4), which utilized the Porter-Silber (5) reaction—i.e., the development of color between phenylhydrazine-sulfuric acid and 17,21-dihydroxy-20-ketosteroids.

3. RESULTS

Means for the preinjection and postinjection free 17-OHCS concentrations for the five groups of subjects are shown in table I. The

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TABLE I

Means for steroid responses to intraoral injections

Treatment group	Number of subjects	Serum free 17-OHCS (μg./100 ml.)		
		Preinjection	Postinjection	Difference
Lidocaine HCl	52	15.57	18.86	3.29
Lidocaine HCl with epinephrine	52	15.98	18.55	2.57
Saline	50	16.25	19.54	3.29
Needle stick only	50	15.02	18.74	3.72
Sham	54	14.67	17.09	2.42
S.D.		4.13		2.96
d.f.		409		253

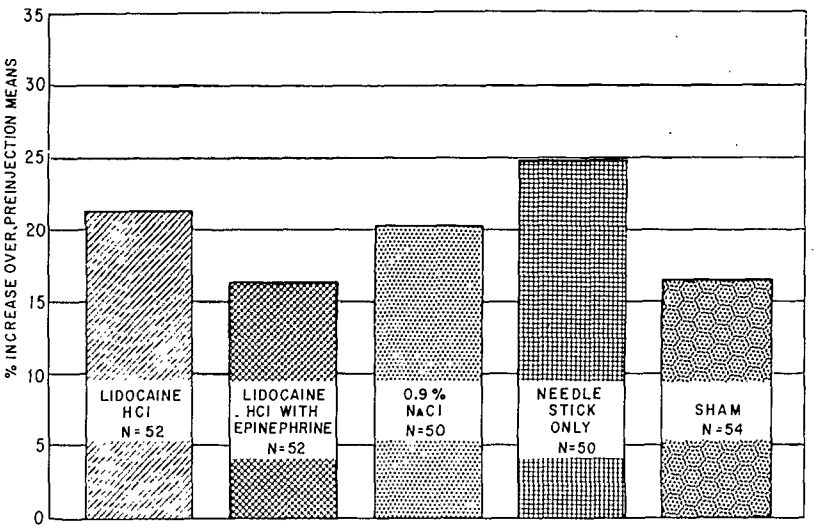

FIGURE 1

Serum free 17-OHCS response to local anesthetic procedures.

preoperative means, ranging from 14.67 to 16.25 μg./100 ml., did not differ significantly for the five groups. However, when the preoperative and postoperative means were compared, there was a highly significant ($P < .001$) increase in the level of serum free 17-OHCS for each group. These mean increases were not significantly different for the five groups of subjects. The group responses are outlined in figure 1 as the mean percentage increase in 17-OHCS levels found in the postinjection serum samples. Since the variances for the five groups were not found to be significantly different, pooled estimates of variance were calculated. From these, the standard deviation for serum steroid was 4.13 μg./100 ml. with

409 degrees of freedom and the standard deviation of the difference between preinjection and postinjection values was 2.96 μg./100 ml. with 253 degrees of freedom.

4. DISCUSSION

In earlier studies of steroid responses in patients receiving intraoral injections the conclusion was drawn that no significant cortical response was produced (3). In this instance, however, the second blood sample was drawn 3 hours after injection and it was pointed out that this interval may have been long enough to obscure any fleeting adrenocortical response that might have been present. In a later study (1) injections were given to 218 subjects, 111 of whom were scheduled for simple exodontia and 107 of whom were directly comparable to the subjects in the present study. The induction of local anesthesia in these subjects produced a significant increase in serum free 17-OHCS levels both at 15 and at 30 minutes after the time of injection. The magnitude of this increase was virtually identical in both the scheduled and nonscheduled patients.

It was thus clear that one or more factors in the local anesthesia procedure were inducing adrenocortical stimulation. The findings of the present study indicate that the actual pain of needle insertion is not a primary factor, that the onset of the symptoms of anesthesia is not responsible, and that the pharmacologic responses to the injected agents are negligible. Rather, the cortical stimulation seemed to result from the frank realization by the patient that he was to receive the injection and from the distress associated therewith.

The possibility that the blood sampling procedure might be held responsible for the steroid changes has been investigated in an experiment in which 60 subjects provided a control blood sample between 7:30 and 8:00 a.m. and a second sample at either 15, 30, or 60 minutes later. No significant increases in steroid levels within these groups could be identified (1).

It is also interesting to compare the results of the present study to those of an exodontia experiment (6) in which 57 subjects provided blood samples both before and 15 minutes after the removal of an erupted lower molar tooth. The mean steroid level increased by 3.45 μg./100 ml. in these exodontia patients. For the 154 subjects who actually received injections in the present study, a mean increase of 3.05 μg./100 ml. was found. The response of the five groups of subjects points out not only the importance of local anesthetic procedures in the production of this cortical stimulation, but also makes clear the importance of psychologic factors in this process.

Certainly no more than subjective observations are required to substantiate that the average patient looks with disfavor upon a projected dental experience. Neither is confirmation needed for the fact that most patients particularly dread the intraoral injections usually associated with such an experience. It is of significance, however, that completely objective biologic criteria may be employed to measure such dental patient reactions. The various agents offered for the control of preoperative anxiety may now be evaluated with objectivity.

To the clinician the finding of this study offers an interesting challenge. Certainly, the first few minutes of the dental appointment, or the anticipation of this period, are very important to the patient. Instead of treating the administration of the local anesthetic as an evil necessary to the subsequent dental procedure, the dentist himself can remove much of the stigma from this procedure with a few reassuring words to the patient and the practice of meticulous anesthetic technics. It is a paradox that the anticipation of the procedure which renders the patient insensitive to pain engenders such distress. Certainly the implication is that we are less than completely attentive to our responsibilities in this regard.

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